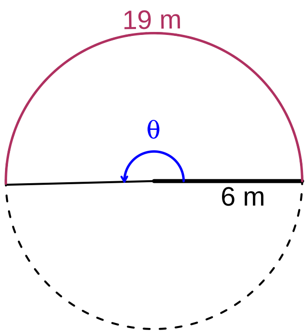
Name: Date:

Trig Final (Solution v33)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 6 meters. The arc length is 19 meters. What is the angle measure in radians?



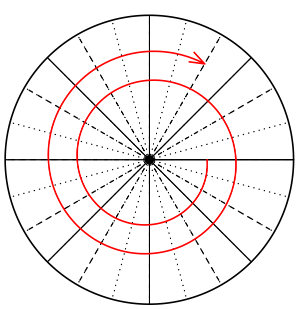
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 3.167$ radians.

Question 2

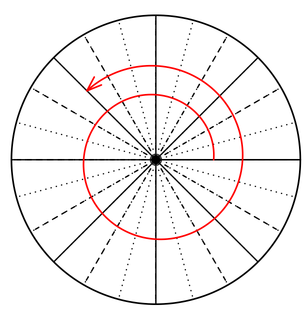
Consider angles $\frac{-11\pi}{3}$ and $\frac{11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-11\pi}{3}\right)$ and $\sin\left(\frac{11\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{-11\pi}{3}$



Find $\cos(-11\pi/3)$

Mark $\frac{11\pi}{4}$



Find $\sin(11\pi/4)$

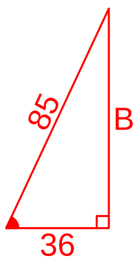
$\cos(-11\pi/3) = \frac{1}{2}$

$\sin(11\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-36}{85}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

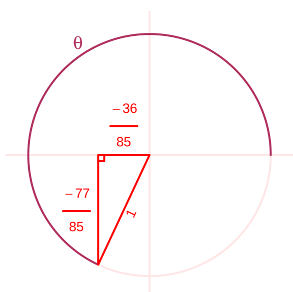
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$36^2 + B^2 = 85^2$$
$$B = \sqrt{85^2 - 36^2}$$
$$B = 77$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-77}{85}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 2.85 meters, a frequency of 4.04 Hz, and a midline at $y = -5.34$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.85\sin(2\pi 4.04t) - 5.34$$

or

$$y = -2.85\sin(8.08\pi t) - 5.34$$

or

$$y = -2.85\sin(25.38t) - 5.34$$